

Module 9 - Strain Gauges

ME3023 - Measurements in Mechanical Systems

Mechanical Engineering

Tennessee Technological University

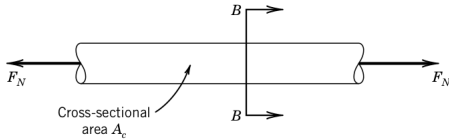
Topic 3 - P3500 Strain Indicator

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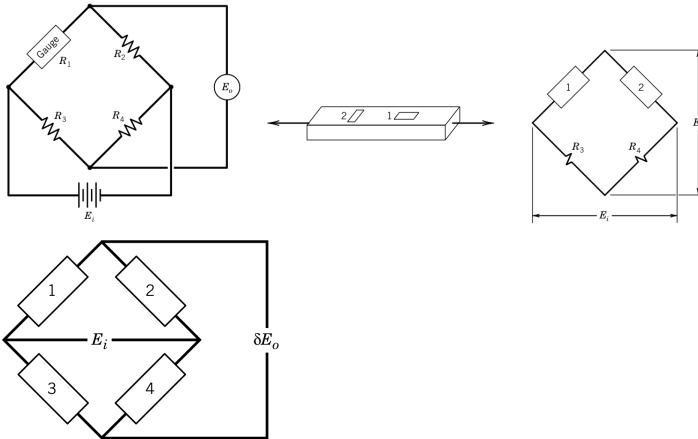
- Units of Microstrain
- Quarter, Half, and Full Configurations
- Wiring the P3500
- Operating the P3500
- Modern Solution



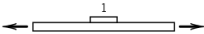
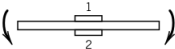

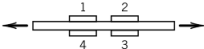

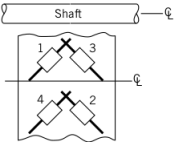
Units of Microstrain



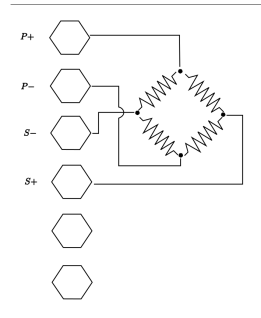
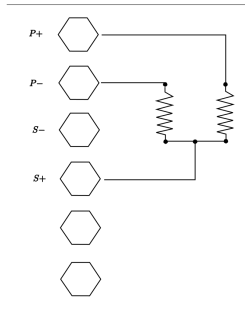
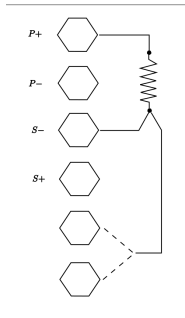
Quarter, Half, and Full Configurations



Quarter, Half, and Full Configurations

| | Arrangement | Compensation Provided | Bridge Constant κ |
|---|---|-------------------------|--------------------------|
|  | Single gauge in uniaxial stress | None | $\kappa = 1$ |
|  | Two gauges sensing equal and opposite strain—typical bending arrangement | Temperature | $\kappa = 2$ |
|  | Two gauges in uniaxial stress | Bending only | $\kappa = 2$ |
|  | Four gauges with pairs sensing equal and opposite strains | Temperature and bending | $\kappa = 4$ |
|  | One axial gauge and one Poisson gauge | | $\kappa = 1 + \nu$ |
|  | Four gauges with pairs sensing equal and opposite strains—sensitive to torsion only; typical shaft arrangement. | Temperature and axial | $\kappa = 4$ |

Wiring the P3500



Operating the P3500

- The instructions are on the unit.
- The balancing process is completed after changing any wiring.



Modern Solution

- The P3500 is old technology, but still does not mean it is bad. I have used them myself and they work great.
- The manufacturer *Vishay Group* has a *more* modern solution with DAQ and multiple channels.
- There are a variety of low cost options available but be careful.
 - Sparkfun - strain gauge basics
 - Robot Shop
 - elecrow